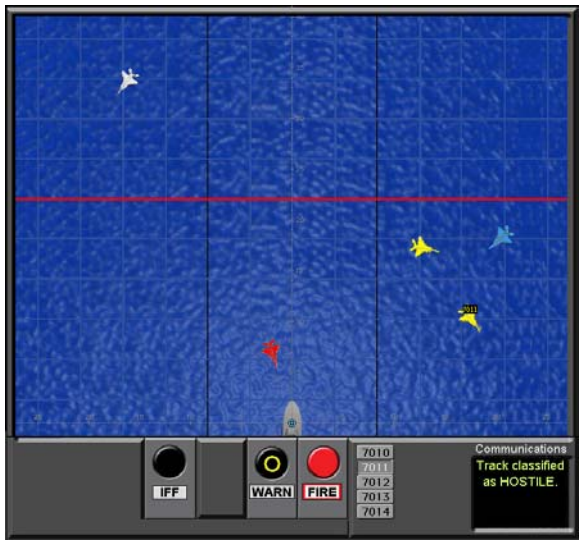
Complex Cognitive Task Battery – "Warship Commander"

The Warship Commander Task (WCT) is a complex cognitive multi-tasking environment for studying user workload and methods for modulating its effects on performance. The WCT provides a common test bed for manipulating users' task load, measuring its neuro-physiological impact on workload and other mental phenomena, and evaluating task/interface augmentations to modulate that impact. As part of the DARPA Augmented Cognition program, our goal has been to develop a common task environment that can be used across multiple laboratories and provide an operational context that emulates basic military command and control tasks. The WCT is suitable for experimental development using undergraduates as research participants while being analogous to a typical naval, air defense, command and control environment. The WCT contains multiple tasks invoking spatial, verbal, and strategic decision-making processes. The task load of the component tasks may be manipulated independently to facilitate task demands consistent with a number of cognitive theories and that are expected to be reflected in neuro-physiological indices of cognition.

Objective

- Develop a real-time interactive task that manipulates task difficulty as well as decision-making, verbal, and spatial processing.
- Work closely with other Aug Cog research teams to develop and evaluate neuro/physiological metrics of cognitive workload and other mental phenomena in the context of the WCT.



A screen shot of the Warship Commander Task

The user plays the role of a Naval Air Warfare Commander protecting a military convoy located off the bottom of the screen. The commander's task involves identifying all aircraft that enter into the airspace, warning threatening aircraft that penetrate the "Line Of Engagement" LOE to turn away, and shooting down any threatening aircraft that fail to heed the warning. The task places a number of perceptual, spatial, decision-making, and memory burdens on the user.

The aircraft appear in waves of different size every 75 seconds. Task load, the objective counterpart to mental workload, is manipulated by the size of each wave of aircraft and their composition. Our validation and calibration studies indicate that a task load of six aircraft in a 75 second period produces a fairly consistent low level of workload for trained users. Larger waves of aircraft produce higher workloads and more stress on users.

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WCT Specifications:

Hardware Requirements (minimum):

- One color monitor, preferably 15" or more, with a resolution of 1024 x 768 and thousands of colors.
- Standard USB or PS-2 Mouse (or trackball) and keyboard.
- Minimum Processor: 64 megabytes of RAM, a Pentium II processor, Windows 98 or later;
  - Sound card with at least two channels (the two channels should be independent)
  - Hard disk with enough free space to store the program and event logs
  - Video card supporting 1024x768 (high speed and large memory buffer recommended)
- Recommended Processor: 512 megabytes of RAM, 1.4 GHz Pentium IV processor or better, Windows 2000
  - Creative Sound Blaster Live! Basic (WDM) Sound Card
  - Nvidia Riva TNT2, Model 4 Video Card
- Serial (COM) port (Optional for use in synchronizing WCT events with external instrumentation)
- Parallel (LPT) port (Optional for use in synchronizing WCT events with external instrumentation)

Outputs (See Experiment Procedures for details):

- Event log, reports all program and user events
- scor file, reports performance measures
- ship file, reports response times and errors from the Ship Status task.

Timing Issues (See Experiment Procedures for details):

- The WCT application uses the system clock for timing.
- WCT is subject to all the capricious behavior inherent in a windows environment. We log user-event interrupts when the system chooses to tell us about them, and we log display changes when we tell windows to update the display.
- A fast processor, fast video card, and no other programs or network connections competing for system resources should produce accurate response times: typically less than 5 ms jitter with rare 10-15 ms jitter on a medium speed (1.4 Mhz) PC.

NOTES:

- The program will run in virtual memory but will perform best if enough free memory is available to load the entire program at once. This helps prevent "lags" due to disk access by Windows during the run.
- Although not necessary, the (advanced) Windows settings should be optimized for applications (rather than background) and no other processes or network links should be running during the experiment.
- A faster processor than the 1.4 mHz development machine should decrease the worst case lag time (currently about 15ms) between a subject's response (mouse click or key press) and the notification by Windows that the event has occurred.
- The WCT is available from: http:///www.pacific-science.com/augcog. You will be required to register for a login before you will be able to download the application and supporting documentation.